S2 PUMA Series 2 with HighSense™ Technology: Turns Power into Speed!

High-Throughput and Excellent Data-Quality for Major, Minor and Trace Elements

The S2 PUMA is equipped with state-of-the-art Silicon Drift Detector (SDD) technology for high count rates, super-fast signal processing, and supreme counting statistics that pay back immediately as excellent precision and sample throughput. The HighSense™ and HighSense™ LE detectors are setting new standards for benchtop energy-dispersive X-ray fluorescence (EDXRF) spectrometers.

Together with the S2 PUMA's powerful 50 W X-ray tube, a 5% better energy resolution and at least 300% higher count rates when compared to previous detectors enable unrivalled analytical performance.

The light element version of the detector – the HighSense LE – uses an ultra-thin high-transmission window for optimal detection of light elements such as F and Na. When the application demands fast and accurate analysis of light elements, the HighSense LE delivers!

Advantages of EDXRF

Sample preparation and analysis using the S2 PUMA is simple and cheap, when compared to alternative wet-chemical methods, such as atomic absorption spectrometry (AAS) or inductively coupled plasma optical emission spectrometry (ICP-OES). The latter require skilled operators and consume pricy and/or hazardous chemicals and accessories. Using the S2 PUMA for your applications also allows you to decrease the time from sampling to result, considering the required dilution step for AAS and ICP-OES. In contrast to AAS and ICP-OES, a simple one-time calibration makes the S2 PUMA ready for your application. Only occasional analysis of a drift correction sample is required: No daily, time-consuming calibration needed!

Power Matters

For XRF analysis, more power means more counts, resulting in faster throughput and/or improved result quality! The majority of EDXRF application uses voltages of 20 kV or more for optimal sample excitation and analytical performance. Thus, the S2 PUMA with a maximum current of 2 mA and 50 kV can make use of 40-50 Watt Power for many applications – "overpowering" all other EDXRF systems on the market (see Figure 1 and Table 1)!

Table 1: S2 PUMA power ranking

	Max. Voltage [kV]	Max. Current [mA]	Max. Power [W]
S2 PUMA	**50**	**2**	**50**
System A	50	1	50
System B	50	3	15
System C	50	2	10

HighSense™ Technology

Besides the two types of detectors, the HighSense package of the S2 PUMA includes a modern, long-life time X-ray tube as well as closely coupled optics (Figure 2). The fast electronics and the high counts rates of the HighSense and the HighSense LE detectors unleash the true power of the S2 PUMA, which is now optimally exploiting the full 50 Watt (Figure 3 and 4). This pays back immediately and results in shorter counting times, better precision or even both.

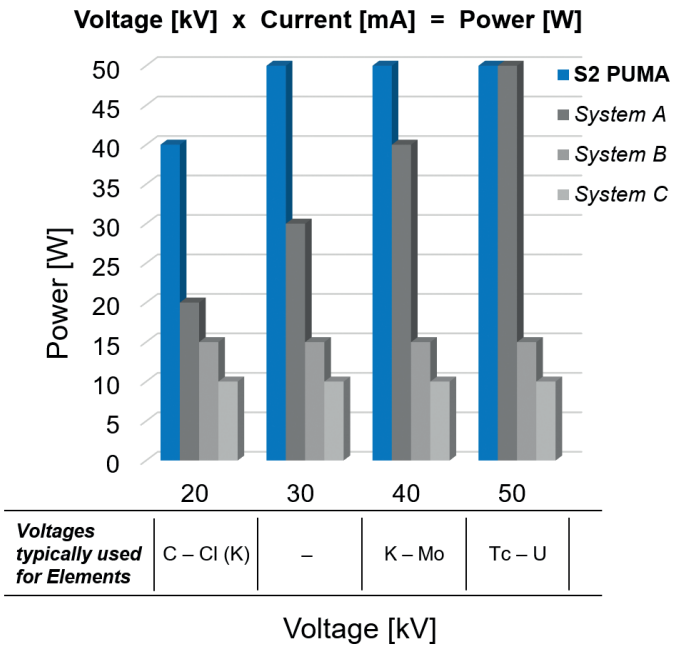

Figure 1: The S2 PUMA sets EDXRF power-benchmarks! 2 mA and 10-50 kV combined with a 50 Watt generator enable high-power EDXRF analysis for most elements.

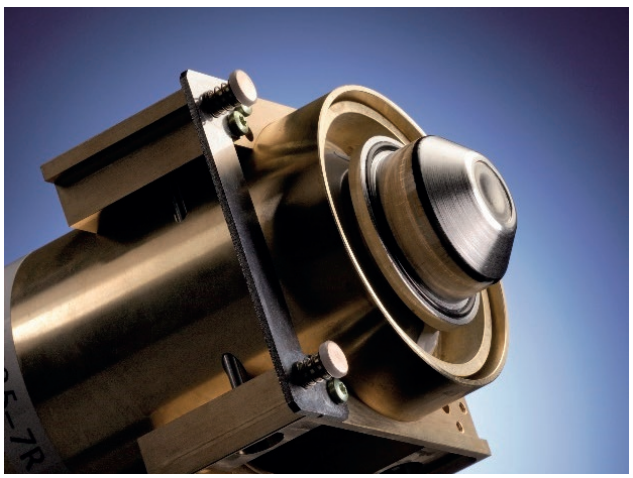

Figure 2: HighSense™ Technology. HighSense X-ray Tube (left) and Detector with Detector cap (right).

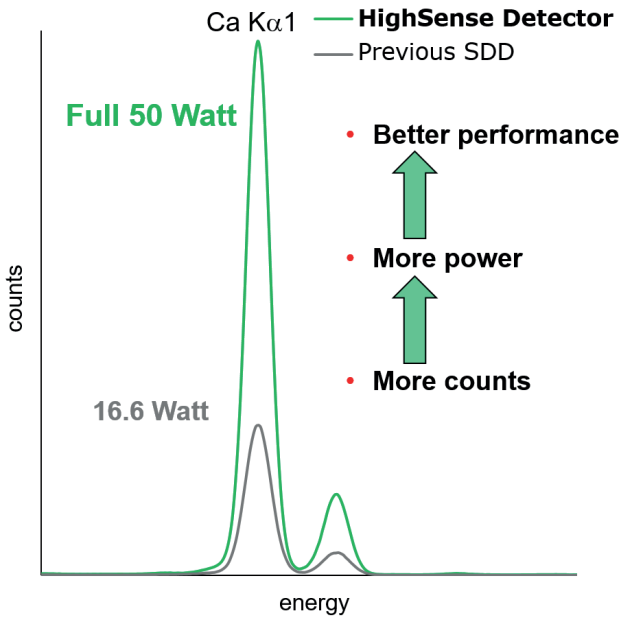

Figure 3: HighSense™ detector – Enabling outstanding EDXRF performance for Na-U.

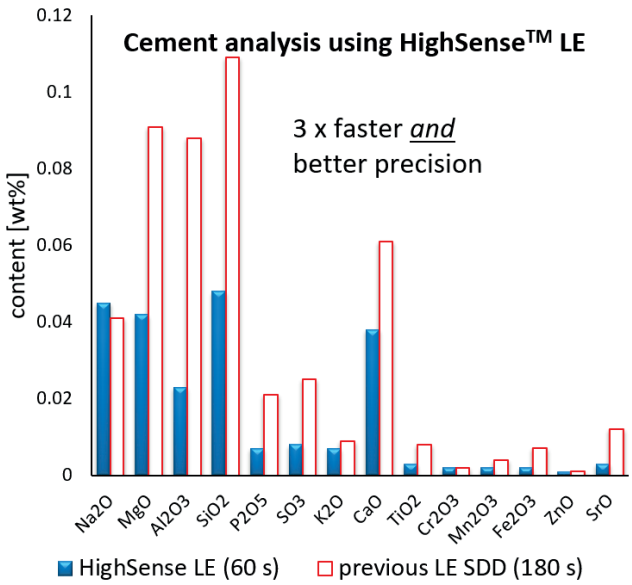

Figure 5: Excellent performance of the HighSense™ LE detector for Cement applications.

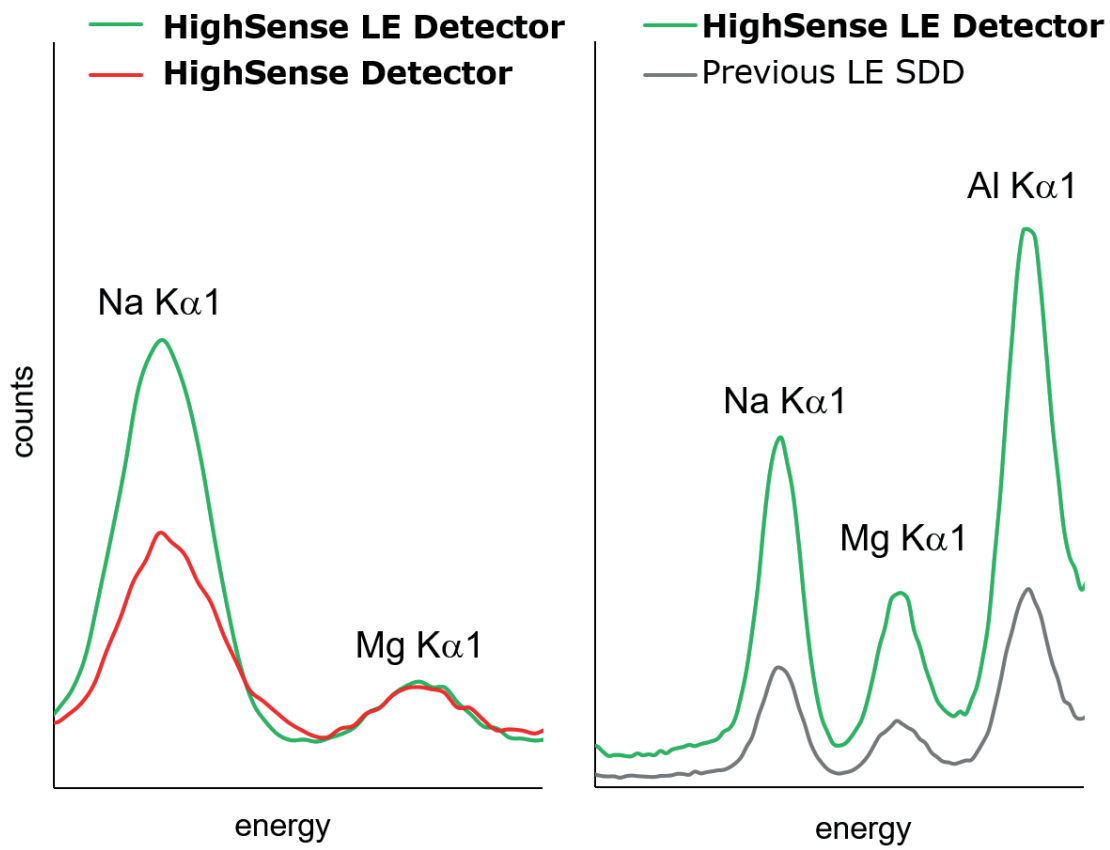

Figure 4: HighSense™ LE detector – The extra thin window results in excellent sensitivity for light elements such as Na and F.

Time is Money: High Throughput with HighSense™ Detectors

Typical industrial EDXRF applications include process control analysis of large numbers of samples. The S2 PUMA with HighSense Technology is made for this, as its new detectors drastically reduce measurement times. In fact, after a threefold reduction of the counting time for cement analysis, the precision achieved by using a HighSense LE detector is still significantly better when compared to the precision achieved by the previous LE detector (see Figure 5 and Table 2): Faster and better – HighSense makes it possible!

Conclusion

The HighSense detectors push the S2 PUMA to the next level of analytical performance (see Table 3 for specifications). An easy-to- replace detector cap adds an extra level of safety for high uptime and low maintenance. Together with the S2 PUMA's unique features such as TouchControl™, SampleCare™, its XY Autochanger, and the Automation option, the S2 PUMA becomes the tailor-made high performance elemental analyzer for many applications in industry, research, and academia.

Table 2: Results of repeatability tests (using a cement reference material prepared as fused bead)

	Known conc. [wt%]	Absolut standard deviation [wt%]		
		HighSense LE		Previous LE SDD
Counting time	--	**180 s**	**60 s**	**180 s**
Na_2O	0.200	0.029	0.045	0.041
MgO	4.455	0.022	0.042	0.091
Al_2O_3	9.079	0.023	0.023	0.088
SiO_2	30.693	0.039	0.048	0.109
P_2O_5	0.034	0.006	0.007	0.021
SO_3	3.140	0.004	0.008	0.025
K_2O	0.690	0.005	0.007	0.009
CaO	49.850	0.034	0.038	0.061
TiO_2	0.687	0.002	0.003	0.008
Cr_2O_3	0.005	0.002	0.002	0.002
Mn_2O_3	0.237	0.001	0.002	0.004
Fe_2O_3	0.860	0.001	0.002	0.007
ZnO	0.015	0.001	0.001	0.001
SrO	0.091	0.003	0.003	0.012

Table 3: Detector Specifications

	HighSense	HighSense LE
Detector Type	Silicon Drift Detector	
Element Range	Na to U	(C) F to U
Window	Be	High-transmission polymer
Input count rates	more than 1,500,000 cps	
Energy Resolution	≤135 eV at Mn Kα	
Cooling	Electric Peltier cooling (no liquid nitrogen, maintenance-free)	

Bruker AXS GmbH

info.baxs@bruker.com

www.bruker.com

Worldwide offices

bruker.com/baxs-offices

Online information

bruker.com/s2puma